# BOT 210 Phytobiotechnology

(Lectures/Labs, 4 credits; CRN61372)
MW, 10:00am – 12:30pm, Hale ʹImiloa 106


**INSTRUCTOR:** Hongwei Li Ph.D.
**OFFICE HOURS:** Monday 1:00 pm – 2:00 pm, or by appointment
**OFFICE:** Hale ʹImiloa 107
**TELEPHONE:** 236-9104
**EMAIL:** hli@hawaii.edu

**EFFECTIVE DATE:** Spring 2016

**WINDWARD COMMUNITY COLLEGE MISSION STATEMENT**

*Windward Community College is committed to excellence in the liberal arts and career development; we support and challenge individuals to develop skills, fulfill their potential, enrich their lives, and become contributing, culturally aware members of our community.*

## COURSE DESCRIPTION

This course provides an introduction to the principles and practical techniques of plant biotechnology. Topics include fundamentals of molecular biology, plant tissue culture and micropropagation, plant DNA and RNA extraction, PCR, DNA cloning, DNA sequencing, plant functional genomics, plant genetic engineering, gene silencing, molecular farming, and their applications. This course provides students hands-on experience and training in recombinant DNA technology, plant tissue culture and genetic engineering.

Pre-Requisites: BOT 101, or AG 152, or MICR 130 and MICR 140, or BIOL 171 and 171L, or consent of the instructor.

**Activities Required at Scheduled Times Other Than Class Times**
You will need to inspect and maintain the growth of your plant tissue cultures. You might have to carry out extended laboratory works at times other than scheduled laboratory periods.

## STUDENT LEARNING OUTCOMES

1. Understand the basic principles of molecular biology.
2. Understand and be able to perform experiments involving recombinant DNA.
3. Understand the principles, techniques and applications of plant tissue culture.
4. Understand the principles and techniques of plant genetic transformation mediated by agrobacterium and particle bombardment.
5. Understand the principles and techniques of plant functional genomics.
6. Discuss the benefits, issues, and risks of biotechnology

## ASSESSMENT TASKS AND GRADING

Your learning outcomes will be achieved through the aid of the following activities:
1. Assigned readings (hand-outs)
2. Prepare lab reports.
3. Homework assignments

You will be evaluated based upon class and laboratory participation, laboratory reports, the ability to maintain aseptic cultures, presentation, and examinations as described below.

***Lecture and Laboratory Participation (50 points)***

You are expected to participate in all lecture and lab activities (50 points). You will also work safely and efficiently in the laboratory. Thus, you will be graded on lecture and laboratory attendance, level of participation, and laboratory work habits. Because of the difficulties in setting up laboratory material, students missing a regularly scheduled laboratory activity cannot be given an alternative assignment. Failure to participate in a scheduled laboratory session will result in a 15-point deduction for each session missed.

***Laboratory Safety Compliance (50 points)***

You must purchase a lab coat and a pair of safety glasses. You must follow standard laboratory operating procedures and safety guidelines during lab practices.

***Laboratory Reports (150 points)***

Your laboratory reports will be examined four times during the semester. Each lab report should consist of followings:

*Title of the experiment*
*Introduction*
*Materials*
*Methods*
*Results and Conclusions*

***Maintenance of Plant Tissue Culture (50 points)***

You will maintain your own in vitro cultures. Assessment will be based upon non-contaminated and healthy cultures throughout the semester. Media transfer should be done accordingly. You should detect contaminated cultures as early as possible to repeat the operation before the end of the semester.

***Presentation (50 points)***

You will select one of topics on the benefits, issues, and risks of plant biotechnology and give a presentation in class. You will be graded based on your presentation and participation of discussion on those topics.

***Exams (300 points)***

There are three exams (2 midterms and final) to assess your knowledge and skills in plant biotechnology. Exams are non-cumulative.

Make up exams will only be given with a valid reason (i.e. medical or other emergency) on the FIRST day you return to class. In such a circumstance, you should make every reasonable attempt to contact the instructor as soon as possible before the exam. Students involved in cheating will receive an "F" grade for the course.

***Grading***

The total possible points:

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| 1. | Lecture and Laboratory Participation | 50 | points |
| 2. | Laboratory Safety Compliance | 50 | points |
| 3. | Laboratory Reports | 150 | points |

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| 4. | Maintenance of Plant Tissue Culture | 50 | points |
| 5. | Presentation | 50 | points |
| 6. | Exams (3) | 300 | points |
| | Total | 650 | points |

Letter grades will be assigned as follows:

A - - - 90% or above in total points.
B - - - 80-89% of total points.
C - - - 70-79% of total points.
D - - - 60-69% of total points.
F - - - Below 60% of total points
I - - - Incomplete; given at the INSTRUCTOR'S DISCRETION when you are unable to complete a small part of the course because of circumstances beyond your control. It is your responsibility to make up incomplete work with a minimum level (or better) of achievement. Failure to satisfactorily make up incomplete work within the appropriate time period will result in a grade change for "I" to the contingency grade identified by the instructor (see catalog).

## LEARNING RESOURCES

**Textbook:** There is no required textbook.
**Lecture materials / Reading Hand-outs:** https://laulima.hawaii.edu/portal

### DISABILITIES ACCOMMODATION STATEMENT

*If you have a physical, sensory, health, cognitive, or mental health disability that could limit your ability to fully participate in this class, you are encouraged to contact the Disability Specialist Counselor to discuss reasonable accommodations that will help you succeed in this class. Ann Lemke can be reached at 235-7448, lemke@hawaii.edu, or you may stop by Hale ʻAkoakoa 213 for more information.*

## BOT 210 Schedule Spring 2016

| | | |
|---|---|---|
| 01/11 | Lecture | Course introduction |
| | Lab | Standard laboratory operating and safety procedures |
| 01/13 | Lecture | Overview of plant biotechnology |
| | Lab | Micropipetting and equipment operation. |
| 01/18 | Holiday | |
| 01/20 | Lecture | Fundamentals of molecular biology |
| | Lab | Solution preparation |
| 01/25 | Lecture | Fundamentals of molecular biology |
| | Lab | Physical and chemical sterilization |
| 01/27 | Lecture | Molecular cloning |
| | Lab | Extraction and quantitation of plant RNA. |
| 02/01 | Lecture | Molecular cloning |
| | Lab | Agarose gel electrophoresis of plant RNA |
| 02/03 | Lecture | Molecular cloning |
| | Lab | Reverse transcription |

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| 02/08 | Lecture | Polymerase Chain Reaction (PCR) |
| | Lab | Primer design and PCR amplification of the gene-of-interest from plants |
| 02/10 | Lecture | Molecular cloning |
| | Lab | Gel purification of PCR products and preparation of LB selective media |
| 02/15 | Holiday | |
| **02/17** | **Exam 1** | |
| 02/22 | Lecture | Molecular cloning |
| | Lab | DNA ligation and *E. coli* transformation |
| 02/24 | Lecture | Molecular cloning |
| | Lab | Identification of clones using colony PCR |
| 02/29 | Lecture | Molecular cloning |
| | Lab | Plasmid preparation, restriction enzyme digestion and sequencing |
| 03/02 | Lecture | Plant bioinformatics |
| | Lab | DNA sequence analysis |
| 03/07 | Lecture | Phylogenetics |
| | Lab | Molecular phylogentic analysis of plants |
| 03/09 | Lecture | Principles and applications of plant tissue culture |
| | Lab | Plant tissue culture media components and preparation |
| 03/14 | Lecture | Principles and applications of plant tissue culture |
| | Lab | Aseptic techniques and surface sterilization of plant seeds |
| 03/16 | Lecture | Arabidopsis thaliana as a model system |
| | Lab | Surface sterilization of explants and callus induction |
| 03/21 &03/23 | Spring | Recess |
| 03/28 | Lecture | Contamination issues in plant tissue culture |
| | Lab | Micropropagation of pineapple using crown tip meristem |
| **03/30** | **Exam 2** | |
| 04/04 | Lecture | Plant genetic engineering: agrobacterium-mediated plant transformation |
| | Lab | Agrobacterium-mediated transient gene expression |
| 04/06 | Lecture | Plant genetic engineering: gene gun |
| | Lab | Agrobacterium-mediated transient gene expression |
| 04/11 | Lecture | Characterization of transgenic plants |
| | Lab | Analysis of GM plants: Plant DNA extraction |
| 04/13 | Lecture | Characterization of transgenic plants |
| | Lab | Analysis of GM plants: Detection of transgenes by PCR. |
| 04/18 | Lecture/Lab | Applications of plant biotechnology |
| 04/20 | Field trip | |
| 04/25 | Lecture/Lab | Public concerns and issues in plant biotechnology: case study and student presentation |
| 04/27 | Lecture/Lab | Public concerns and issues in plant biotechnology: case study and student presentation |
| 05/02 | Lecture | Principles of genome analysis and functional genomics of plants |
| | Lab | Public genomic data resources |
| 05/04 | Lecture | Principles of genome analysis and functional genomics of plants |
| **05/09** | **Final Exam** | **10:00am -12:00pm** |

(Please note that the schedule is subject to change.)